Capisic Brook Total Maximum Daily Load (TMDL)
Draft Report

Below Lucas Street, September 2003

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July 2005
Report # DEPLW0713

TABLE OF CONTENTS

PART I: WATERBODY DESCRIPTION, IMPAIRMENTS, TMDL TARGETS, AND BMP IMPLEMENTATION PLAN

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

PART II: TMDL PLAN

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS USED

BMP	Best Management Practice
CCC	Criteria Chronic Concentration (for toxic contaminants)
CMC	Criteria Maximum Concentration (for toxic contaminants)
CSO	Combined Sewer Overflow
CWP	Center for Watershed Protection
ENSR	ENSR Corporation
GIS	Geographic Information System
IC	Impervious Cover
MDEP	Maine Department of Environmental Protection
MRSA	Maine Revised Statutes Annotated
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
PETE	Partnership for Environmental Technology Education
SI	Stressor Identification
SWAT	Surface Water Ambient Toxics
SWQC	(Maine's) Statewide Water Quality Criteria
TMDL	Total Maximum Daily Load
US EPA	U.S. Environmental Protection Agency

PART I: WATERBODY DESCRIPTON, IMPAIRMENTS, TMDL TARGET, AND BMP IMPLEMENTATION PLAN

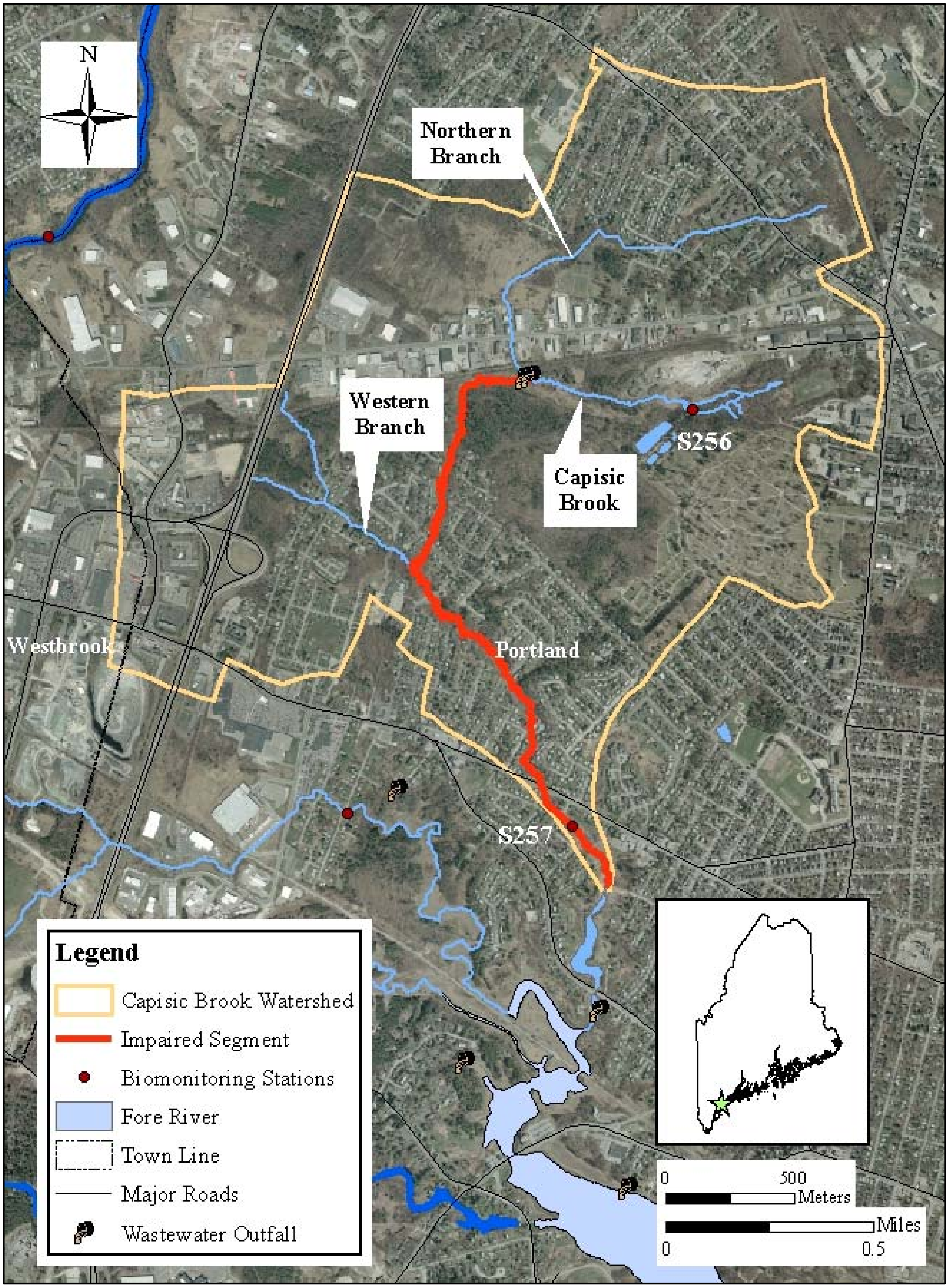
1. DESCRIPTION OF WATERBODY

Description of Waterbody and Watershed

Capisic Brook (Fig. 1) is located in Portland (southern Maine, 43°37'N, 70°17'W, HUC ME0106000105), and is of moderate length (~2.5 miles, mainstem only) and watershed size (~1,290 acres excluding Capisic Pond). The stream consists of several branches, with headwaters located east of Forest Avenue near the intersection with Allen Avenue (Rt. 100), in Evergreen Cemetery off of Stevens Avenue (Rt. 9), and just east of I-95 near the intersection with Warren Avenue. The mainstem of Capisic Brook originates in a wooded area within Evergreen Cemetery. The northern branch, which originates east of Forest Avenue, flows through a residential and a commercial-industrial area before joining the mainstem just below Evergreen Cemetery. The stream then flows through a residential area and is joined by the western branch, which originates near I-95, ~1,000 m downstream below the mainstem – northern branch confluence. The western branch receives a significant amount of runoff from I-95 and development located along the highway and especially west of I-95 Exit 8. From this second confluence, Capisic Brook continues to flow through a residential area down to Capisic Pond, which is created by the Capisic Pond dam just below Capisic Street. Below the dam, the stream flows into the estuarine Fore River, and then into Portland Harbor and Casco Bay. Appendix A contains a set of photos of the stream.

The impaired segment of the stream is on the mainstem (Fig. 1), and extends from the confluence of the mainstem with the northern branch to Capisic Pond. The segment is influenced by commercial, industrial, transportation, and dense housing development as well as two Combined Sewer Overflows (CSOs). This second-order portion of the stream has a wetted width of 2 - 3 m in the summer and a bankfull width of 3.5 – 4.3 m. Water depth in the summer is 6 – 10 cm with a few deeper areas. Much of the stream channel was altered during the 1950s when the sewer system was put in place. Since that time, the stream has regained some of its original shape and hence does not appear channelized in most areas. One exception is the stretch immediately above biomonitoring station S257 where the channel is overwidened and has little sinuosity. The stream bed at station S257 is composed of gravel and sand (~50 % each) but further upstream sand and silt are more dominant. Capisic Brook is a low-gradient stream with a mixture of riffle-run system and some pools. The majority of the impaired segment has a riparian buffer composed of young trees with an understory of herbaceous plants and ferns. In some areas, the riparian buffer has been replaced with lawn or brush. The lower part of the watershed was first urbanized in the early 1900s, and the upper part mostly from the 1950s onwards. The entire watershed is classified as a "regulated area" under the NPDES Phase II Stormwater Program.

Fig. 1. Capisic Brook watershed, impaired segment, and location of biomonitoring stations



Impaired Stream Segment

A 3.0 mile segment of Capisic Brook, which is classified as a Class C stream[1], was included in Maine's 2002 and 2004 303 (d) lists (MDEP 2002b, 2004b) of waters that do not meet State water quality standards. The listing was based on a preliminary stream assessment and sampling results from the Biological Monitoring Program of the Maine Department of Environmental Protection (MDEP; see next section). Additional data collected in 2003 and further analyses indicated that the upper segment of the stream is not impaired (PETE/MDEP 2005). As a result, this TDML covers only the impaired segment of the stream at a length of 1.6 miles, i.e., less than the 3.0 miles listed (see Fig. 1).

2. IMPAIRMENTS AND STRESSORS OF CONCERN

Detection of Impairments

Maine has an ongoing biological monitoring program within the MDEP, as well as biological criteria for the different classes of rivers and streams in Maine (38 MRSA § 465). The biomonitoring program uses a tiered approach to protecting aquatic life uses, and assesses the health of rivers and streams by evaluating the composition of resident biological communities (mainly benthic macroinvertebrates), rather than, or sometimes in conjunction with, directly measuring the chemical or physical qualities of the water (such as dissolved oxygen levels or concentrations of toxic contaminants)[2]. This biological assessment approach is extremely useful, especially for small streams impaired by stormwater runoff and the mix of associated pollutants, because benthic organisms integrate the full range of environmental influences and thus act as continuous monitors of environmental quality.

Description of Impairments

Maine's 2002 and 2004 303 (d) lists (MDEP 2002b, 2004b) note "Aquatic life" as the impaired use for Capisic Brook with "Urban NPS, Habitat, CSO" as the potential sources for the impairment (CSO appears only in the 2004 list). This assessment was based on data collected by the MDEP Biomonitoring unit on macroinvertebrate communities at two stations in Capisic Brook in 1996, 1999, and 2003 (S256 and S257, see Fig. 1). The aquatic life criteria set for a Class C stream (see Part II, Table 1) were always met at the upstream station (S256), but never at the downstream station (S257). Monitoring results were documented in the MDEP's SWAT (Surface Water Ambient Toxics) Program Reports (1999, 2001a, 2004a) as well as in Davies et al. (1999) and the Urban Streams Project Report (PETE/MDEP 2005).

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[1] See Part II, section 2., Maine State Water Quality Standards for further explanation.
[2] Note that all of Maine's water quality standards have to be met for a waterbody to attain its classification.

Stressors of Concern and Their Sources

The 303 (d) lists (MDEP 2002b, 2004b) and SWAT reports (MDEP 2001a, 2004a) indicated "Urban NPS, Habitat, CSO" as the potential sources for the impairment of the macroinvertebrate community. To gain a better understanding of specific stressors and their sources responsible for urban nonpoint source pollution in Maine, the MDEP in 2003 launched a special project to collect a large amount of biological, chemical, and physical data throughout four urban watersheds, including the Capisic Brook watershed. The data collected under the "Urban Streams Nonpoint Source Assessments in Maine" project, or Urban Streams Project (PETE/MDEP 2005), were analyzed during a series of Stressor Identification (SI) workshops held in May and June 2004. For Capisic Brook, the SI analysis confirmed overall urban development as the primary factor responsible for stressors directly or indirectly linked to aquatic life impairments. No discreet non-stormwater point source of pollution was identified in the Capisic Brook watershed although there are two stormwater outfalls that discharge into the stream (above Brighton Avenue in lower part of watershed, and near Sunset Lane on the western branch). Two combined sewer overflows (CSOs) in the upper part of the watershed, at the start of the impaired segment, are scheduled to be disconnected in 2008 (J. True, MDEP, pers. comm.). These CSOs were identified as contributing to impairments (see Table 3). Following is a list of the six stressors the SI analysis identified as major factors causing the impairment, and the data this determination was based on. Sampling results are extensively documented in Chapter 6 of the Urban Streams Report (PETE/MDEP 2005); sampling methods and information on the SI analysis are provided in Chapter 2 of the report.

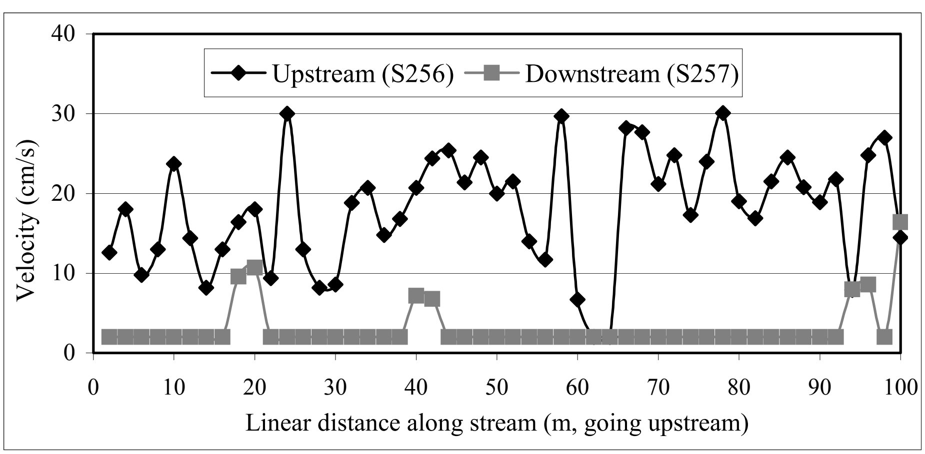
Stressor 1: Impaired instream habitat

A geomorphological survey found low sinuosity as a result of channelization. A survey of large woody debris in the stream found a low abundance (25 pieces in a 100 m stretch) and intermediate size distribution (average size 12 cm).

Stressor 2: Altered hydrology

Landuse analysis showed that ~23 % of the watershed consists of impervious areas (see Part II, section 3. for details) which will influence hydrology in a number of ways (e.g., reduced infiltration of precipitation and recharging of groundwater reserves leading to reduced base flow; high peak flows). Channelization (straightening, widening) in some areas of the stream has locally caused a uniformly slow flow regime (Fig. 2).

Fig. 2. Velocity profile at S257 and S256 in 2003.



Stressor 3: Presence of toxic contaminants

Toxic contaminants include three metals (aluminum, iron, lead) that were monitored in 2003 and 2004 and exceeded the CCC (Criteria Chronic Concentration) of Maine's Statewide Water Quality Criteria (SWQC) in two baseflow sampling events (Table 1) at the downstream (S257, impaired) and upstream (S256, not impaired) station. The role of toxic contaminants as a stressor was also indicated by high conductivity levels in the stream and signals from the macroinvertebrate community.

Table 1. Toxic contaminant sampling results during baseflow conditions from stations S257 and S256 in 2003 and 2004. *, exceeds SWQC CCC.

	Metal concentration in mg/L		
	Al	**Fe**	**Pb**
S257			
July 15, 2003		1.3*	0.0030*
July 26, 2004	0.160*		0.0009*
S256			
July 26, 2004	0.590*		0.0010*
Aquatic Life Criterion, CCC	0.087	1.0	0.0004

Stressor 4: Elevated nutrients

Total Phosphorus and Total Nitrogen exceeded EPA's recommended nutrient criteria for Ecoregion XIV in all baseflow and stormflow sampling events at the downstream station (S257, impaired; Table 2). At the upstream station (S256, not impaired), concentrations (only measured in 2003) were always well below EPA's recommended criteria.

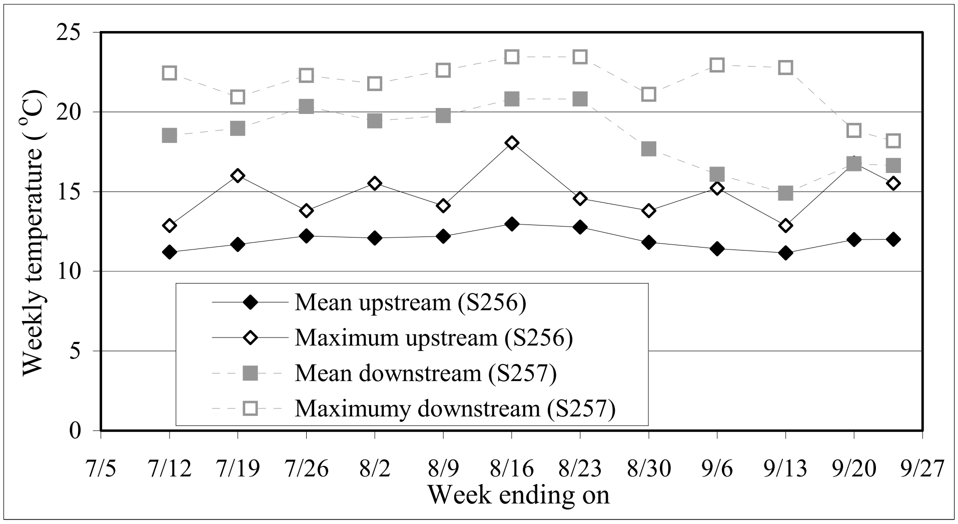
Table 2. Nutrient sampling results (in mg/L) from stations S257 and S256 in 2003 and 2004. TP, Total Phosphorus; TN, Total Nitrogen. *, exceeds the EPA-recommended nutrient criterion for Ecoregion XIV.

Flow conditions	**Date**	**S257**		**S256**	
		TP	**TN**	**TP**	**TN**
Baseflow	7/15/2003	0.077*	1.22*		
	8/11/2003	0.063*	1.23*	0.015	0.31
	8/25/2003	0.046*	1.23*	0.015	0.33
	9/9/2003	0.050*	1.29*		
Stormflow	5/27/2003	0.052*			
	11/21/2003	0.110*			
	2/24/2004	0.045*		0.019	
	2/26/2004	0.037*		0.015	
EPA criterion		0.031	0.71	0.031	0.71

Stressor 5: Elevated water temperature

Instantaneous and continuous (Fig. 3) data of instream water temperature collected in the summer of 2003 at the downstream station S257 were always much higher than at the upstream station S256. Summer temperatures at the downstream station were in, or close to, a range that is considered stressful for some sensitive fish and macroinvertebrates.

Fig. 3. Continuous instream water temperature at S257 and S256 in 2003.



Stressor 6: Low dissolved oxygen

Instantaneous and continuous data of DO concentrations collected in the summer of 2003 at the downstream station S257 were close to or below the required Class C level of 5 mg/L on some occasions (see Fig. 4 for diurnal DO data). At the upstream station S256, DO concentrations were always >9 mg/L.

Fig. 4. Diurnal DO at S257 and S256 in 2003.

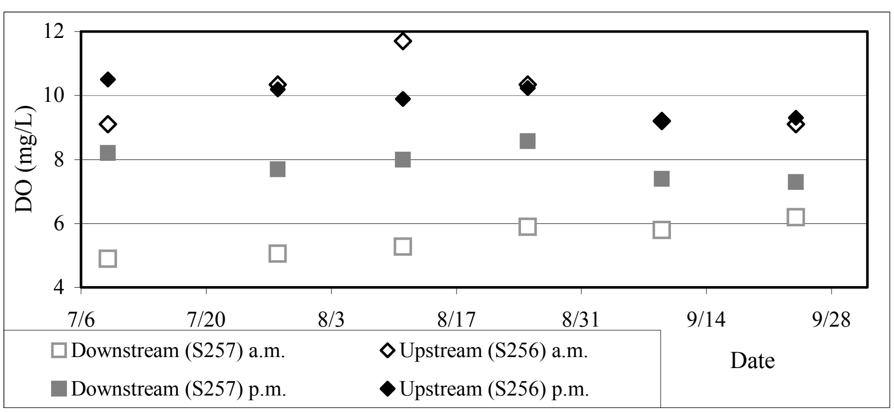


Table 3 lists the likely and possible sources responsible for the stressors identified during the stressor identification analysis for the downstream station (S257). Some identified sources (italicized in Table 3) represent natural conditions, while several sources (highlighted in Table 3) are related to watershed imperviousness. For example, for the two highest ranking stressors (Impaired instream habitat and Altered hydrology), the sources Increased stormflow volume and Stormwater outfalls are linked to impervious surfaces present in the watershed. Also, the source Sewage discharge from CSOs, which was important for three of the six stressors, is related to impervious surfaces because CSO events only occur when road runoff entering the sewer system during storm events exceeds the system capacity. These sources and the resulting stressor are generally absent, or of minor importance, in non-urbanized watersheds. Recent studies (as summarized in CWP 2003) have shown that the percentage of impervious cover (IC) in a watershed strongly effects the health of aquatic systems because land surfaces that block infiltration of rainwater cause increased amounts of stormwater to run off into gutters, untreated storm sewers, CSOs, or directly to streams. In general, stream quality declines as imperviousness exceeds 10 % of watershed area, and may be severely compromised at greater than 25 % (Schueler 1994, CWP 2003). In Maine, existing local data indicate that an IC of 10-15 % is adequate for attainment of Class C aquatic life criteria (MDEP 2005).

Table 3. Identified stressors and their sources in the Capisic Brook watershed. Sources representing natural conditions are italicized, those that are related to impervious surfaces are highlighted.

Stressor	**Importance**	**Sources**	
		Likely	**Possible**
1. Impaired instream habitat	High	Channelization	
		Low gradient	
		Decreased riparian tree cover	
		Increased storm flow volume	
2. Altered hydrology	High	High percentage of impervious surfaces	Stormwater outfall
		Channelization	
		Low gradient	
3. Presence of toxic contaminants	Medium	Sewage discharge from CSOs	Dumping
		Winter road sand/road dirt	*Natural sources (soils)*
		Runoff from local roads and parking lots	Atmospheric deposition
			Documented spills
			Septic/sewage leaks
4. Elevated nutrients	Medium	Sewage discharge from CSOs	Runoff from local roads and parking lots
			Lawn/landscaping runoff
			Animal waste
			Sewer/septic system leaks
			Atmospheric deposition
5. Elevated water temperature	Medium	Impervious surfaces	
		Locally reduced riparian shading	
6. Low dissolved oxygen	Medium/ low	Sewage discharge from CSOs	*Low channel gradient*
		Elevated nutrients	Reduced riparian shading (ii)
		Reduced riparian shading (i)	

Sewage Discharge into Stream

As shown in Table 3, sewage discharge from CSOs in the upper part of the watershed was identified as a likely source for three of the six stressors in Capisic Brook. Table 4 shows discharge data (based on the SWMM model as reported by the City of Portland; J. True, MDEP, pers. comm.) from the two CSOs in question for the last five years. The City of Portland has completed surveys for two projects required for CSO removal, and is scheduled to complete construction of these projects in 2006 and 2008. Actual removal or blockage of the CSOs will follow at a later date but overflows should end upon completion of the second project (i.e., in 2008; J. True, MDEP, pers. comm.). Sewage discharge affects biota indirectly by elevating nutrient levels which promotes excessive algal growth and results in the depletion of dissolved oxygen. There may also be direct effects of sewage discharges in the form of toxic contaminants. Because of these negative impacts, timely CSO elimination is a critical factor in restoring aquatic life in Capisic Brook. The City of Portland should continue to consult with MDEP about project design related to CSO elimination to minimize the potential for negative effects (e.g., increased stormwater input into the stream) arising from this activity.

Table 4. Discharge data for CSOs discharging into impaired segment of Capisic Brook.

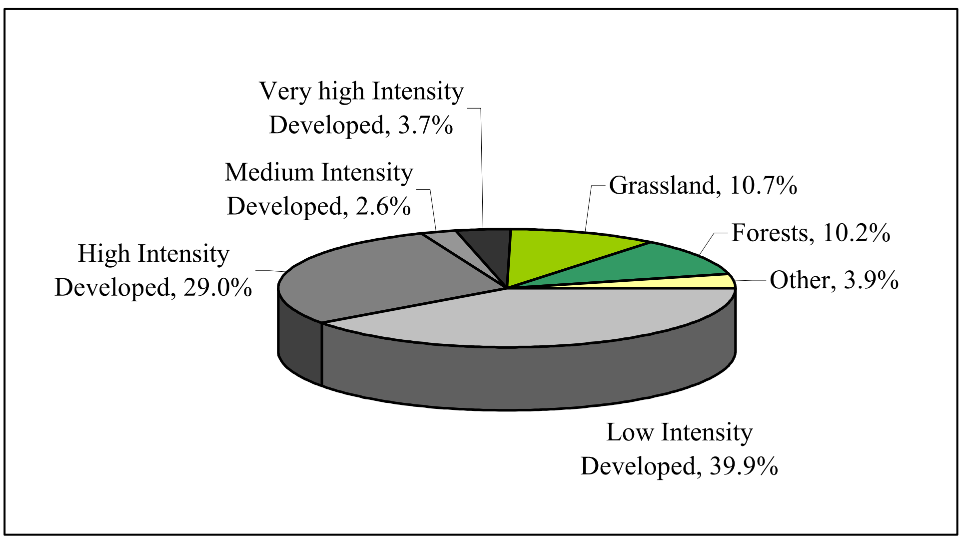
	CSO 042		CSO 043	
Year	**Number of events**	**Gallons discharged**	**Number of events**	**Gallons discharged**
2004	40	29 million	40	2.6 million
2003	54	14 million	9	0.4 million
2002	52	15 million	52	~3 million
2001	28	21 million	28	2.4 million
2000	49	16 million	50	3.1 million

3. IMPERVIOUS COVER AND LANDUSE INFORMATION

Urban development primarily affects aquatic systems due to the high percentage of impervious cover (IC) present in urban areas. Effects include impairments in water quality, stream morphology, hydrology, and aquatic communities (CWP 2003). For Capisic Brook, the relationship between IC and the stressors identified for this waterbody is shown in Table 3. The parameter “impervious cover” can serve as a surrogate for a variety of impairments that are related to stormwater runoff (including CSO input) because it relates the primary causal factors to specific impairments (ENSR 2004). Stormwater runoff is water that does not soak into the ground during a rain storm but flows over the surface of the ground until it reaches a nearby waterbody. Stormwater runoff often picks up pollutants such as soil, fertilizers, pesticides, animal waste, and petroleum products. These pollutants may originate from driveways, roads, golf courses, and lawns located within a watershed[1]. The negative effects of urban stressors on overall stream quality can be much reduced by disconnecting impervious surfaces from the stream so that runoff does not reach a waterbody untreated, or by converting impervious surfaces to pervious surfaces. Implementation of other measures that address habitat restoration, flood plain recovery, and riparian recovery can be an effective and less costly first step in abatement. More information on these Best Management Practice (BMP) options is provided in section 5., Implementation Plan.

The % impervious cover in the Capisic Brook watershed above Capisic Pond , i.e., within the area draining into the impaired segment (Fig. 1), was determined from landuse data and a conversion of landuse to % IC. Details regarding this procedure are given in Part II, section 3. Analysis showed that landuse is dominated by low, medium, high, and very high intensity development, which together account for 75 % of all land uses (Fig. 5; see also Part II, Table 2, Fig. 1). Grassland and forests account for ~10 % each, and other smaller uses for 4 %. Converting landuse to % IC, imperviousness in the Capisic Brook watershed was estimated to be 23 %. It is not known how much of this impervious cover is "effective" IC, that is impervious cover that is directly connected to the stream via hard surfaces or in close proximity, and from which runoff enters a waterbody untreated. Additional information to be gathered during the implementation phase of this TMDL will guide future BMP implementation.

Fig. 5. Distribution of landuse types, with percentages, in the Capisic Brook watershed.



[1] For more information on stormwater issues visit the MDEP Nonpoint Source Pollution website at www.maine.gov/dep/blwq/doceducation/nps/background.htm

4. TOTAL MAXIMUM DAILY LOAD (TMDL) TARGETS

Details regarding the determination of the TMDL targets set for Capisic Brook are given in Part II of this document, and a brief summary is provided here. For further details please consult Part II.

Non-attainment of water quality criteria in the lower reaches of Capisic Brook suggests that this area of the stream has exceeded its loading capacity, namely the mass of pollutants a waterbody can receive over time and still meet water quality targets. The Stressor Identification (SI) analysis indicated that urban stressors have caused the impairment in the macroinvertebrate community and the failure to attain aquatic life criteria. “Urban stressors” is a catch-all term encompassing a wide variety of effects caused by urbanization, with the majority of the effects being related, directly or indirectly, to stormwater runoff from impervious surfaces. Because of the major effect stormwater runoff has on aquatic systems (CWP 2003), the “Impervious Cover Method” (IC method), as employed by ENSR in a pilot TMDL (ENSR 2004), is used here to estimate current and target annual runoff volumes and annual pollutant loads for Capisic Brook based on a target % IC of 13 %. It should be noted that this % IC is effective IC. Parameters used in load estimates are annual runoff, annual rainfall, pollutant concentration in runoff (event mean concentrations), and watershed area. The target % IC was determined in accordance with MDEP policy (MDEP 2005) using MDEP data, information from the literature, and local conditions. A second TMDL target is set with the disconnection of two CSOs that have been identified as a source for certain urban stressors (Table 3). The City of Portland is in the planning stages for CSO separation and completion of this project is set for 2008 (J. True, MDEP, pers. comm.).

5. IMPLEMENTATION PLAN

The goal of this TMDL is to have the lower reaches of Capisic Brook meet applicable water quality criteria, that is to have the macroinvertebrate community attain Class C standards. Impairments observed in the aquatic communities in Capisic Brook have been attributed to urban stressors, including additional stormwater runoff from impervious surfaces and CSO input. Stormwater effects can be lessened, water quality improved, and impairments curtailed by implementing best management practices (BMPs) and remedial actions in a cost-effective manner using the following adaptive management approach:

- Implement BMPs strategically through a phased program which focuses on getting the most reductions, for least cost, in sensitive areas first (for example, begin with habitat restoration, flood plain recovery, and treatment of smaller, more frequent storms);
- Monitor ambient water quality to assess stream improvement;
- Compare monitoring results to water quality standards (aquatic life criteria);
- Continue BMP implementation in a phased manner until water quality standards are attained.

Effects from two CSOs can be lessened by reducing stormwater runoff (as described in the next section) but complete removal of effects requires CSO separation, as described in CSO Separation, below.

Reduction in Impervious Cover effects

Abatement measures to reduce impervious cover (IC) effects can take one of three forms: they can consist of general stream restoration techniques (including habitat and flood plain restoration), they can disconnect impervious surfaces from the stream or they can convert impervious surfaces to pervious surfaces. In general, practices that achieve multiple goals are preferred over those that achieve only one goal (ENSR 2004). For example, installing a detention basin along with runoff treatment systems provides more effective abatement of stormwater pollution than installing detention BMPs alone.

Because of the effort and cost involved in implementing these BMPs, a long-term strategy can be used to achieve water quality standards. For example, lower cost stream restoration techniques that lessen stormwater effects immediately can be implemented in the short-term to initiate stream recovery .

The following three sections list the options available for BMPs aimed at stream restoration techniques, and disconnection and conversion of impervious surfaces. Because many factors must be considered when choosing specific structural BMPs (e.g., target pollutants, watershed size, soil type, cost, runoff amount, space considerations, depth of water table, traffic patterns, etc.), the sections below only suggest categories of BMPs, not particular types for particular situations. Implementation of any BMPs will require site-specific assessments and coordination among local authorities, industry and businesses, and the public. Advice on the selection, design, and implementation of any remedial measures can be obtained from the MDEP (Bureau of Land and Water Quality, Division of Watershed Management), the Cumberland County Soil and Water Conservation District, or web-based resources (see Appendix B for suggestions).

In summary, implementation of remedial measures will occur under an adaptive management approach in which certain measures are implemented, their outcome and effectiveness evaluated, and future measures selected so as to achieve maximum benefit based on new insights gained. The order in which measures are implemented should be determined with input from all concerned parties (e.g., city, businesses, industry, residents, regulatory agencies, watershed protection groups). Further details on the measures suggested below is provided in Chapter 6 of the Urban Streams Report (PETE/MDEP 2005). In addition, Appendix C lists BMPs in a matrix format in which traditional and newly developed ("Low Impact Development") BMP types are rated according to their ability to mitigate for impacts of impervious cover and applicability to certain urban situations (ENSR 2005). The matrix was developed by ENSR as a multi-use tool and thus contains some BMPs and IC impacts not directly applicable to Capisic Brook.

<u>General Stream Restoration Techniques</u>

Following is a list of general BMPs and stream restoration techniques and how they can alleviate stressors and improve stream health. Short-term implementation of these measures will complement the long-term strategy of disconnecting or removing impervious surfaces suggested above. Web-based information resources that can aid with planning and implementing these measures are given in Appendix B.

- Maintaining the riparian buffer where it is adequate, i.e., has a width of at least 15 m (50 feet) and is composed of native plants, including mature trees. Enhancing or replanting the riparian buffer where it is inadequate. An adequate buffer will improve shading, large woody debris availability, and food input, and provide terrestrial and aquatic habitat for insects with aquatic life stages, thus enhancing recolonization potential of the macroinvertebrate community.
- Improving channel morphology (restoring sinuosity, pool availability and diversity, and flow diversity) by installing double wing deflectors and vegetating sand bars in the stream (see PETE/MDEP 2005, Chapter 6, Fig. 23) will improve flow conditions and habitat for macroinvertebrates.
- Reclamation of flood plains by returning these areas to a natural state will naturally moderate floods; reduce stress on the stream channel; provide habitat for fish, wildlife, and plant resources; promote groundwater recharge; and help maintain water quality. Protection of intact flood plains should be a high priority.
- Reducing the input of winter road sand and road dirt by sweeping roads, parking areas or driveways will reduce excess sedimentation.
- Reducing the incidence of spills (accidental and deliberate) for example by improving education and training will reduce input of toxic contaminants.
- Eliminating the potential for sewer/septic system leaks by regularly inspecting and maintaining sewer/septic systems will reduce toxic contaminant and nutrient input.
- Minimizing lawn/landscaping runoff by minimizing fertilizer use and using more efficient application methods will reduce nutrient input.
- Minimizing waste input from pets by picking up waste will reduce bacteria and nutrient input.
- Eliminating illicit discharges by detecting and eliminating discharges will reduce toxic contaminant and nutrient input.
- Reducing erosion from land use activities with mulches, grass covers, geotextiles or riprap will minimize sediment input into the stream.
- Investing in education and outreach efforts will raise public awareness for the connections between urbanization, impervious cover, stormwater runoff, and overall stream health.
- Encouraging responsible development by promoting Smart Growth or Low-Impact Development guidelines will minimize overall effects of urbanization.
- Reducing new impervious cover by promoting shared parking areas between homes or between facilities that require parking at different times will reduce impacts related to impervious surfaces. Lowering minimum parking requirements for businesses and critically assessing the need for new impervious surfaces will have the same effect.
- Eliminating septic systems in the watershed by expanding the municipal sewer system will reduce toxic contaminant and nutrient input.

Disconnection of Impervious Surfaces

The purpose here is to prevent stormwater runoff from reaching the stream directly (via the storm drain system), thus reducing % effective IC. There are various options for achieving this goal:

- Channel runoff from large parking lots, roads or highways into
  - detention/retention BMPs (e.g., dry/wet pond, extended detention pond, created wetland), preferably one equipped with a treatment system;
  - vegetative BMPs (e.g., vegetated buffers or swales);
  - infiltration BMPs (e.g., dry wells, infiltration trenches/basins, bio-islands/cells);
  - underdrained soil filters (e.g., bioretention cells, dry swales).
- Redesign and retrofit existing detention to provide extended detention for 6 month and 1 year storms.
- Guide runoff from paved driveways and roofs towards pervious areas (grass, driveway drainage strip, decorative planters).
- Remove curbs on roads or parking lots.
- Collect roof runoff in rain barrels.

All of these options for disconnection of impervious surfaces provide for a virtual elimination of runoff during light rains (which account for the majority of runoff events but not the majority of pollutant or stormwater input), reduction in peak discharge rate and volume during heavy rains, sedimentation or filtration of some pollutants, and improvement in groundwater recharge. Disconnection of impervious surfaces can often be achieved at reasonable cost and, unlike the removal of impervious surfaces (below), does not generally create material for disposal. These BMPs cover most sizes of impervious surfaces (private driveways and small building roofs to large parking lots and highways), and many have been widely used in cold climates.

Conversion of Impervious Surfaces

This is achieved by replacing impervious surfaces with pervious surfaces, for example by using the following BMPs:

- Replace asphalt on little-used parking lots, driveways or other areas with light vehicular traffic with porous pavement blocks or grass/gravel pave.
- Replace small areas of asphalt on large parking lots with bioretention structures (bio-islands/cells).
- Replace existing parking lot expanses with more space-efficient multistory parking garages (i.e., go vertical).
- Replace conventional roofs with green roofs.

These options for conversion of impervious surfaces also provide for a virtual elimination of runoff during light rains (which account for the majority of runoff events), reduction in peak discharge rate and volume during heavy rains, filtration of some pollutants, and improvement in groundwater recharge. However, a number of problems exist with these options (e.g., removed asphalt or roofing shingles must be landfilled or recycled), and removal of existing impervious surfaces may be operationally unfeasible. Some of these

BMPs are still in the experimental stage for cold climates and may not prove suitable for widespread implementation. In spite of these limitations, new construction or building projects should consider these and other possibilities for reducing impervious cover.

Stormwater Separation to Eliminate CSO

To achieve this target, the City of Portland needs to complete the two projects (East Branch and West Branch Capisic Brook Projects) that will facilitate management of stormwater amounts removed from the sewer system in the course of CSO elimination. Surveys for the projects have been largely completed but design has not yet started (J. True, MDEP, pers. comm.). The City should attempt to stay on target for a 2008 separation date. Because there is a significant potential that CSO separation will result in new impacts to the stream, city staff should continue consultations with the MDEP regarding project design. Designs allowing for maximum treatment and detention of stormwater flows, for example extended detention basins, detention or wet ponds, or created wetlands, are preferable over simple flood control or minimal treatment options.

6. MONITORING PLAN

Maine DEP will evaluate the progress towards attainment of Maine's water quality standards by monitoring the macroinvertebrate community in Capisic Brook under the Biomonitoring Unit's existing rotating basin sampling schedule. At the same time, the Streams TMDL unit will collect water chemistry samples during stormflow conditions to determine whether acute criteria of the Maine Statewide Water Quality Criteria for certain toxic contaminants or sediment are exceeded. Adaptive implementation of the remedial measures listed above should be pursued until aquatic life criteria are met. Once criteria have been met in at least two sampling events with normal summer conditions, no further remedial measures are required. If criteria continue to be violated once BMPs and restoration techniques have been implemented and the IC has been reduced to13 %, this TMDL will enter a secondary phase in which the approach proposed in this document will be reassessed.

PART II: TMDL PLAN

1. PRIORITY RANKING, LISTING HISTORY, AND ATMOSPHERIC AND BACKGROUND LOADING

Priority Ranking and Listing History

The large number of streams listed for nonpoint source (NPS) pollution on the 303 (d) list requires Maine to set priority rankings based on a variety of factors. Factors include the severity of degradation, the time duration of the impairment, and opportunities for remediation. Maine has set priority rankings for 303 (d) listed streams by TMDL report completion date, and has designated Capisic Brook for completion by 2005. Capisic Brook‘s priority ranking was raised on the 2004 303 (d) list (MDEP 2004b) when the stream was included in the Urban Streams NPS Assessment Project (PETE/MDEP 2005).

Atmospheric Deposition

Atmospheric deposition of pollutants (metals) that occurs within a watershed will reach a stream through runoff containing material deposited on land, direct contact of the stream with rain, and the settling of dry, airborne material on the stream surface. As for contaminated runoff, it is assumed that in watersheds with a relatively low percent imperviousness enough soil remains that most atmospherically deposited metals are buffered and adsorbed before they can reach the stream (except in watersheds sensitive to acidification). Where imperviousness is quite high, as in the Capisic Brook watershed (23 %), it is unknown whether (or how much) material deposited from the atmosphere reaches a stream with runoff. A reduction in the % impervious cover (IC) in the watershed would help in reducing any negative effects from pollutants derived from the atmosphere. Other potential sources (i.e., direct contact with rain, and deposition in the stream of airborne material) are considered to convey minimal loads to Capisic Brook because of the small surface area of the stream channel itself.

Natural Background Levels

No part of Capisic Brook is in what could be called a “natural setting” as the entire watershed has been affected by human activities. Even the upstream segment, which is not impaired, is located within a wooded area that shows some anthropogenic effects (walking path along the stream, minor input of runoff, young age of trees due to past logging events; PETE/MDEP 2005). As a result, no information on natural background levels of pollutants in this watershed is available. In general, it is difficult to separate natural background loads from the total nonpoint source load (US EPA 1999), and the information would not contribute significantly to the analysis for this TMDL.

2. DESCRIPTION OF THE APPLICABLE WATER QUALITY STANDARDS

Maine State Water Quality Standards

Water quality classification and water quality standards of all surface waters of the State of Maine have been established by the Maine Legislature (Title 38 MRSA 464-468). According to Maine's Water Classification Program, Capisic Brook is classified as Class C. Table 1 summarizes the water quality standards applicable to Capisic Brook. The Maine Legislature also defined designated uses for all classified waters, which state that "Class C waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life."

Table 1. Maine water quality criteria for classification of Class C streams (38 MRSA § 465).

Numeric Criterion	Narrative Criteria	
Dissolved Oxygen	**Habitat**	**Aquatic Life (Biological)**
5 ppm; 60% saturation	Habitat for fish and other aquatic life	Discharges may cause some changes to aquatic life, provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

Antidegradation Policy

Maine's anti-degradation policy requires that "existing in-stream water uses and the level of water quality necessary to sustain those uses, must be maintained and protected." (For designated uses of a Class C stream see previous section.) Additionally, MDEP must consider aquatic life, wildlife, recreational use, and social significance when determining "existing uses".

3. TMDL TARGET: LOADING CAPACITY, IMPERVIOUS COVER, AND CSO ELIMINATION

Loading Capacity

Loading capacity is the mass of pollutants that Capisic Brook can receive over time and still meet numerical or narrative water quality targets. The downstream segment of Capisic Brook currently does not meet Maine's aquatic life criteria for a Class C stream (Table 1), suggesting that its loading capacity is exceeded. For streams in urbanized areas, additional stressors affecting aquatic life exist in the form of non-pollutant impacts such as alterations in channel morphology and the flow regime, or elimination of the riparian buffer.

Stressors should be controlled to bring the stream into compliance. In this TMDL, the extent of impervious cover (% IC) in the watershed is used as a surrogate for the complex mixture of pollutant and non-pollutant stressors attributable to urban development, especially stormwater effects. By reducing the % effective IC using the options listed above in Part I, section 5., Implementation Plan, a number of urban stressors and their sources can be addressed simultaneously (e.g., impaired instream habitat related to high storm flows; altered hydrology due to high imperviousness; toxic contaminant, nutrient, and dissolved oxygen problems related to CSO discharges and impervious surface runoff; elevated water temperatures exacerbated by impervious surface runoff). The use of imperviousness as the TMDL target requires the application of the Impervious Cover Method.

Impervious Cover (IC) Method

The IC Method was developed by the Center for Watershed Protection (CWP) to assess the impacts of urbanization on small streams and receiving waters, and to document the linkage between the % impervious cover in watersheds and instream water quality. The IC Method was used by ENSR in a pilot project to develop TMDLs for streams potentially impaired by urban nonpoint source pollution (ENSR 2004). ENSR selected the IC Method for their pilot project "primarily because it provides a strong and straightforward link between water quality impairment and causal factors" (ENSR 2004). The IC Method can be used to estimate current annual runoff volume and loads for a range of pollutants using the current extent of watershed imperviousness (for current % IC determination see following section). The IC Method can also be used to estimate target volumes and loads based on a target extent of imperviousness. In this TMDL, target pollutant loads are presented primarily to describe potential loadings and determine load reductions. They do not represent end-of-pipe loadings, or loadings for individual storms. Rather, they represent total loads of pollutants entering a stream during small and large rainfall events occurring throughout the year and originating from non-distinct sources. Estimates shown here are therefore not appropriate for use in a permitting, enforcement, or monitoring context.

Impervious Cover and Landuse Information

As a first step for calculating the % impervious cover in the Capisic Brook watershed, the watershed boundary (Part I, Fig. 1) was determined. This was done based on a drainage map obtained from the City of Portland, on 10 m contour lines, and actual stormwater drainage systems. Watershed imperviousness was determined from landuse data and a conversion of landuse to % IC. Landuse data were derived from "Maine_Combo_ Landcover", a GIS map layer developed by MDEP staff that combines data from Maine Gap Analysis Program (GAP) and USGS Multi Resolution Landcover Characterization (MRLC) coverages[1]. Both GAP and MRLC are based on 1992 Land-Sat TM satellite imagery. Metadata for Maine_Combo_Landcover are maintained by MDEP's GIS unit. Landuse

[1] To minimize uncertainties in precise landuse type (e.g., different types of urban developments, forests or wetlands), the original 19 "Maine_Combo_Landcover" types present in the Capisic Brook watershed were grouped into the nine generalized types shown in Fig. 1.

information presented here includes the area above Capisic Pond, i.e., all areas draining into the impaired segment (Fig. 1). Within this area, landuse is dominated by low, medium, high, and very high intensity development, which together account for 75 % of all landuses (Table 2, Fig. 1). Grassland and forests account for ~10 % each, and other smaller uses for 4 %.

Table 2. Extent of various landuse types in the Capisic Brook watershed. Letters a-e shown in the first column refer to the (urban) land cover types listed in Table 3. (Note: different terms are used here than in Table 3 for landuse types b-f to more accurately reflect actual landuse; also see footnote to Table 3.)

Landuse Type		Acres	%
e	Low Intensity Developed	514	39.9
b, c	High Intensity Developed	373	29.0
-	Grasslands	137	10.7
-	Forests (Upland Woody Vegetation)	131	10.2
a	Very High Intensity Developed	48	3.7
d	Medium Intensity Developed	33	2.6
-	Other[1]	61	4.8
-	Total watershed area	1287	100

[1] Other" landuse categories are [in order of decreasing area (≤34 acres) or percentage (≤2.6 %)] Wetlands, Nonvegetated, and Water.

The method used to convert landuse to % IC was developed by MDEP staff (MDEP 2001b) by applying a % imperviousness formula to the "Maine_Combo_Landcover" GIS layer. The resulting values for imperviousness of certain land cover types in Maine are presented in Table 3. Calibration (i.e., groundtruthing) of the method led to the addition of a multiplier to give a final formula for watershed % IC of:

$$\text{Watershed \% IC} = 0.85 \; * \left(\frac{\sum_{a}^{f} (\text{Acres of landuse type} * \text{Estimated \% IC})}{\text{Total watershed area}} \right)$$

Where Acres of landuse type a-f[1] = see Table 2
Estimated % IC for land cover type a-f[1] in Maine = see Table 3
Total watershed area = see Table 2

Using this formula, % IC for the Capisic Brook watershed was estimated to be 23 %. It is not known how much of this IC is "effective" IC, that is impervious cover that is directly connected to the stream via hard surfaces or in close proximity, and from which runoff enters a waterbody untreated. Additional information to be gathered during the implementation phase of this TMDL will show the percentage of effective IC in the watershed, which is likely to be lower than 23 %.

[1] Landuse type 'f' does not occur in this watershed.

Fig. 1. Landuse in the Capisic Brook watershed

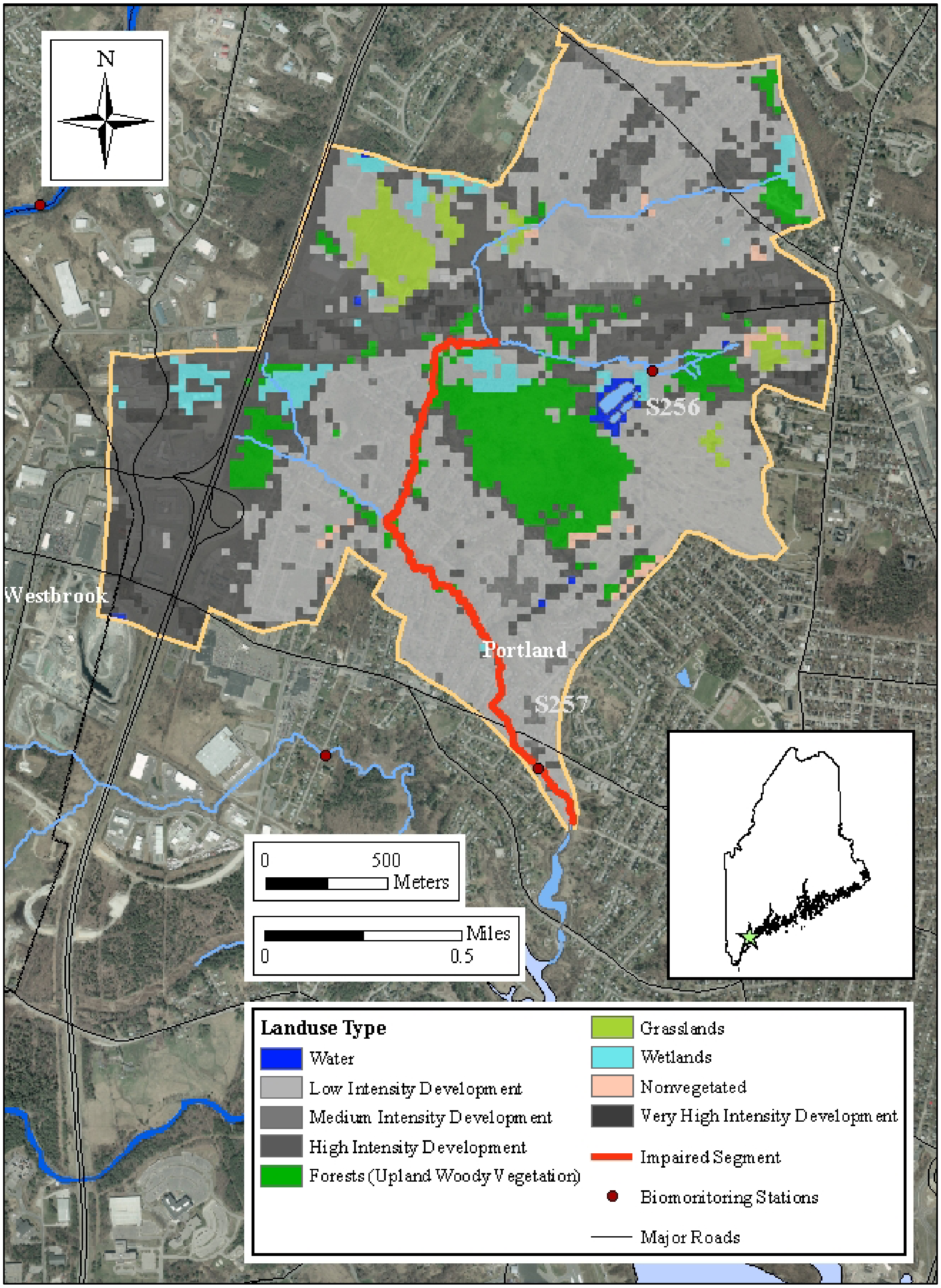


Table 3. Estimated % impervious cover (IC) for urban land cover[1] types in the "Maine_Combo_Landcover" GIS map layer (MDEP 2001b). Letters a-f shown in the first column refer to the landuse types listed in Table 2.

Land Cover Type		Estimated % IC
a	Urban Industrial	90.20
b	Dense Residential Developed	56.50
c	Commercial-Industrial-Transportation	54.04
d	High Intensity Residential	27.11
e	Low Intensity Residential	17.26
f	Sparse Residential Developed	11.98

[1] Because of the way land cover types were derived from two GIS datasets, terms used here do not necessarily reflect the actual landuse (e.g., residential). Land cover types do, however, accurately reflect the extent of imperviousness due to development associated with each category.

Estimation of Pollutant Loads

The Impervious Cover Method uses the percentage of IC in a watershed and other relevant parameters such as annual runoff, annual rainfall, pollutant concentration in runoff (event mean concentrations, EMC), and watershed area to estimate current and target annual stormwater runoff volumes and annual loads of pollutants (e.g., metals, nutrients, sediment). The following three-step process is employed to estimate values (ENSR 2004):

1. Calculate Runoff Volume Coefficient

$$\mathbf{Rv = 0.05 + 0.9\ Ia}$$

Where Rv = Runoff Volume Coefficient
Ia = Impervious fraction

2. Calculate Annual Runoff Volume

$$\mathbf{R = P * Pj * Rv}$$

Where R = Annual runoff (inches)
P = Annual rainfall (inches)
Pj = Fraction of rainfall events producing runoff

3. Calculate Annual Pollutant Load

$$\mathbf{L = R * C * A * U}$$

Where L = Annual pollutant load (lbs)
C = Pollutant concentration in stormwater (mg/L)
A = Watershed area (acres)
U = Unit conversion factor, 0.226

Parameter values can be obtained from the published literature or from local sources, and are most useful if they are region-specific. Table 4 shows the parameter values and their sources that were used for the annual load calculations for Capisic Brook as shown in Table 6. The pollutants included in Tables 4 and 6 were identified as significant stressors for Capisic

Brook (nutrients; Part I, Table 3). Pollutant concentrations from the general literature were used here for load calculations because only two data points for Total Phosphorus were available from storm sampling in the Capisic Brook watershed (MDEP/PETE 2005).

Table 4. Parameter values for IC model and their sources. Pollutant concentrations given in parentheses after each parameter were recorded during stormflows in May and November 2003 in Capisic Brook (see Appendix C iv in MDEP/PETE 2005).

Parameter		Value	Source
Ia	Impervious fraction	23 %	GIS analysis
P	Annual rainfall (inches)	44.0 in	Portland Jetport (www.worldclimate.com)
Pj	Fraction of rainfall events producing runoff	0.9	CWP 2003
C	Pollutant concentration in stormwater (mean event mean concentration, EMC)	mg/L	CWP 2003 (Table 16)
	Total Phosphorus	0.32	
	Total Nitrogen	2.39	
A	Watershed area (acres)	1287 acres	GIS analysis

Using the parameters in Table 4 in the three-step process shown above, annual runoff volume and annual pollutant loads at the current % IC and at a target (lower) % IC can be estimated. An appropriate target % IC for Capisic Brook was selected by considering local conditions (ameliorating and exacerbating) within the framework of the target % IC range of 10 - 15 % established by MDEP for Class C waterbodies (MDEP 2005). Given the conditions shown in Table 5, a target % IC of 13 % was set for Capisic Brook. It should be noted that this target denotes the extent of effective IC, i.e., IC that is directly connected to the stream via hard surfaces or is in close proximity to the stream, and from which runoff enters a waterbody untreated. Using this target % IC would reduce the projected stormflow runoff volume and pollutant load by 35 % (Table 6). As explained in "Impervious Cover Method", above, estimates shown in Table 6 are not appropriate for usage in a permitting, enforcement, or monitoring context.

Table 5. Conditions considered in selection of target % impervious cover for Capisic Brook.

Ameliorating conditions	Exacerbating conditions
Presence of a riparian buffer >10 m in width along 63 % of the stream (PETE/MDEP 2005)	Absence of riparian buffer along 16 % of the stream (PETE/MDEP 2005)
	Impermeable soils (clays and silts of glacial-marine origin) reducing infiltration potential
	Extensive development in flood plain

Table 6. Estimated annual stormwater runoff volume and nutrient loads in Capisic Brook at current and target % impervious cover (IC).

Pollutant	**Runoff volume (inches per year)**		**Estimated nutrient load (lbs per year)**		**% Reduction**
	At 23 % IC (current)	**At 13 % IC (target)**	**At 23 % IC (current)**	**At 13 % IC (target)**	
Stormwater	10.2	6.6			
Total Phosphorus			947	616	35
Total Nitrogen			7,075	4,597	35

Limitations of the Impervious Cover Method

The impervious cover (IC) method can be used to efficiently characterize water quality impairment and establish surrogate TMDL targets for % IC, or stormwater runoff volume, or pollutant reduction targets for watersheds that are impaired by stormwater (ENSR 2004). There are five limitations that affect the use of the method in Capisic Brook as follows:

1. Limitation: The IC model applies to 1st through 3rd order streams.
   Effect: Capisic Brook is a 1st to 2nd order stream, i.e., use of the model is appropriate.

2. Limitation: This method does not account for non-stormwater pointsource pollutant loadings, so it would not be appropriate where these loadings are a significant source of impairment.
   Effect: There are no non-stormwater point sources of pollution in the watershed, and violation of aquatic life criteria in this watershed is believed to be caused by stormwater (including CSOs) and/or nonpoint source pollution, exacerbated by instream and riparian habitat disturbances.

3. Limitation: This method uses event mean concentrations for determination of pollutant loads. This will provide reasonable accuracy over long time periods (i.e., annual loads), but since concentrations vary significantly from storm to storm, this method should not be used for estimating loads for individual storm events.
   Effect: The method is used here only for estimating annual loads, not loads for individual storm events. In addition, it is emphasized that load estimates are primarily used for descriptive purposes (see section 3., subsection Impervious Cover Method).

4. Limitation: This method does not account for in-stream water quality processes.
   Effect: The magnitude and importance of in-stream water quality processes (e.g., contribution of natural sources to toxic load) is unknown and can therefore not be accounted for regardless of which method is used for load estimates.

5. Limitation: Additional site specific information is required for identification and specification of Best Management Practices (BMPs) to achieve TMDL goals.

Effect: Suggestions for BMPs, remedial actions, and restoration techniques aimed at removing identified stressors, or mitigating their effects, are made in Part I, section 5. Implementation of these BMPs will aid substantially in reducing the % IC and its effects. However, a reduction of the IC by the full 10 % (from 23 % to 13 %) will require site specific information for optimal implementation of BMPs.

Stormwater Separation to Eliminate CSO

Two Combine Sewer Overflows (CSOs) discharging into the stream in the upper part of the watershed (see Part I, Fig. 1, Table 6) were identified as significant sources for the stressors Presence of toxic contaminants, Elevated nutrients, and Low dissolved oxygen (Part I, Table 3). Therefore, to remove these stressors, a second TMDL target is set with the elimination of the two CSOs in question. The City of Portland should continue to work towards CSO elimination with a target date of 2008 (J. True, MDEP, pers. comm.). The City should maintain consultation with MDEP to minimize any negative effects of the elimination project (e.g., increased stormwater input into the stream, construction of detention ponds) on Capisic Brook.

4. LOAD ALLOCATIONS

All Load Allocations (LAs) are given the same 11 % IC allocation as the Waste Load Allocations (WLAs) (see next section). This approach was chosen because LAs must be accounted for but it was not feasible to separate the loading contributions from nonpoint sources, background, and stormwater.

5. WASTE LOAD ALLOCATIONS

The entire Capisic Brook watershed is classified as a “regulated area” under the NPDES Phase II Stormwater Program. Under this program, stormwater discharges are considered as point sources and are allocated as waste loads. The only NPDES permitted discharge is for two Combined Sewer Overflows (CSOs); permittee is the City of Portland.

In this TMDL, two TMDL targets are set, namely a reduction in % IC and CSO elimination. The target Reduction in % effective IC is used as a surrogate for the complex mixture of stormwater runoff, and pollutant and non-pollutant stressors attributable to urban development. For this target, the ‘WLAs’ and ‘LAs’ are established at a % IC of 11 %, which allows for a margin of safety of 2 % as shown in Table 7. Resulting target pollutant (nutrient) loads are also shown in the table. Again, it should be stressed that the loads as shown in Table 7 are not appropriate for use in a permitting, enforcement, or monitoring context (see Part II, section 3., subsection “Impervious Cover Method”). They are broad estimates useful in approximating relative contributions and overall load reductions. For the second TMDL target, CSO elimination, the CSOs, which are permitted under the Maine PDES Program, are allocated a Waste Load of "0" because they is scheduled for removal in 2008 (J. True, MDEP, pers. comm.).

Table 7. Estimated target annual load and waste load allocations for runoff volume and nutrients in Capisic Brook.

	Runoff volume (inches per year)	Pollutant (lbs per year)		% reduction
		Total Phosphorus	Total Nitrogen	
Combined Sewer Overflow (WLA)	0.0	0	0	0
Waste Load Allocations, Load Allocations (11 % IC)	5.6	521	3,890	30
Margin of Safety (2 % IC)	1.0	95	707	5
Total Allocation (13 % IC)	6.6	616	4,597	35

6. MARGIN OF SAFETY

This TMDL includes an explicit margin of safety of 2 % impervious cover, which accounts for the uncertainty in the selection of a numeric water quality target of 13 % effective IC. An implicit margin of safety is built into the choice of % IC as the TMDL target because imperviousness has a multitude of effects on streams, all of which combine to affect aquatic life. Selection of only one parameter such as toxic contaminants or nutrients instead of % IC would result in a less comprehensive removal of likely stressors causing the impairment. Finally, removal of CSO discharges will completely eliminate nutrient (and toxic contaminant) input from this source, rather than lowering it to a level below the loading capacity of the stream or below established criteria.

7. SEASONAL VARIATION

Critical conditions can occur for aquatic life and habitat in stormwater-impaired streams at both low and high flows. Frequent small storms can contribute large volumes of runoff and a mix of pollutants. High flows can cause channel alterations, increased pollutant loads from scouring and bank erosion, wash-out of biota, and high volume pollutant loading. Increased % impervious cover and the resulting increase in surface runoff reduces the amount of infiltrating rainfall that recharges groundwater. This diminished base flow can further stress aquatic life and cause or contribute to aquatic life impairments through loss of aquatic habitat and increased susceptibility of pollutants at low flow. Because stormwater volume varies throughout the year, and stream impairment can be contributed at various flow volumes, use of the average stormwater volumes / event mean, annual mean, or other average runoff estimate to calculate an annual pollutant load is appropriate and adequately accounts for seasonal variation. Furthermore, specific BMPs implemented will be designed to address loadings during all seasons.

8. PUBLIC PARTICIPATION

Public participation in the Capisic Brook TMDL development will be ensured through several avenues. A preliminary review draft TMDL, which has been reviewed by MDEP staff (J. Dennis, M. Evers, D. Miller, L. Tsomides, Bureau of Land and Water Quality), will be distributed to watershed stakeholder organizations including

- Katherine Earley/Brad Roland, City of Portland
- Beverly Bayley-Smith, Casco Bay Estuary Project, Portland
- Mike Doan and Joe Payne, Friends of Casco Bay, South Portland
- Betty McInnes, Cumberland County Soil and Water Conservation District

Paper and electronic forms of the *Capisic Brook TMDL, Draft Report* will be made available for public review in three ways: the report will be available for viewing at the Augusta office of the MDEP; it will be posted on the MDEP Internet Web site; and a notice will be placed in the 'legal' advertising of a local newspaper. The following ad will be printed in the Sunday editions of the Portland Press Herald on July 17 and 24, 2005. The U.S. Environmental Protection Agency (Region I) and interested public will be provided a 30 day period (from July 15 to August 15, 2005) to respond with draft comments.

PUBLIC NOTICE FOR CAPISIC BROOK -In accordance with Section 303(d) of the Clean Water Act, and implementation regulations in 40 CFR Part 130, the Maine Department of Environmental Protection has prepared a Total Maximum Daily Load (TMDL) report (DEPLW0713) for Capisic Brook in Portland, Cumberland County. This TMDL report estimates the current extent of impervious surfaces, and the reductions in impervious surfaces and application of general stream restoration techniques required to enable the stream to meet Maine's Water Quality Criteria.

A Public Review draft of the report may be viewed at the Maine DEP Offices in Augusta (Ray Building, Hospital St., Rt. 9) or on-line at: http://www.maine.gov/dep/blwq/comment.htm.

Send all written comments by August 15, 2005 to Melissa Evers, Maine DEP, State House Station #17, Augusta, ME 04333, or email: Melissa.Evers@maine.gov.

REFERENCES

CWP (Center for Watershed Protection). 2003. Impacts of Impervious Cover on Aquatic Systems. Watershed Protection Research Monograph No. 1. Center for Watershed Protection, Ellicott City, MD. 142 pp.

Davies, S.P., L. Tsomides, J.L. DiFranco & D.L. Courtemanch. 1999. Biomonitoring Retrospective: Fifteen Year Summary for Maine Rivers and Streams. Maine Department of Environmental Protection, Augusta, ME; DEP LW1999-26. 190 pp.

ENSR. 2004. Draft Pilot TMDL Applications Using the Impervious Cover Method. ENSR Corporation, Westford, MA.

2005. Best Management Practices for Mitigating Impacts of Impervious Cover. ENSR Corporation, Westford, MA.

Maine Department of Environmental Protection (MDEP). 1999. Surface Water Ambient Toxic Monitoring Program, 1996 technical report. Maine Department of Environmental Protection, Augusta, ME; DEPLW 1999-3.

2001a. Surface Water Ambient Toxic Monitoring Program, 1999 technical report. Maine Department of Environmental Protection, Augusta, ME; DEPLW 2001-8.

2001b. Summary of the Method Used to Develop an Algorithm to Predict the % Imperviousness of Watersheds. Dennis, J. & A. Piper, Maine Department of Environmental Protection, BLWQ, Augusta, ME; internal document. 2 pp.

2002b. 2002 Integrated Water Quality Monitoring and Assessment Report ["305 (b) report"]. Maine Department of Environmental Protection, BLWQ, Augusta, ME; DEPLW 0633.

2004a. Surface Water Ambient Toxic Monitoring Program, 2002-2003 technical report. Maine Department of Environmental Protection, BLWQ, Augusta, ME; DEPLW 0693.

2004b. DRAFT 2004 Integrated Water Quality Monitoring and Assessment Report ["305 (b) report"]. Maine Department of Environmental Protection, BLWQ, Augusta, ME; DEPLW 0665.

2005. DRAFT Percent Impervious Cover TMDL Guidance for Attainment of Tiered Aquatic Life Uses. Maine Department of Environmental Protection, Augusta, ME. 3 pp

Partnership for Environmental Technology Education / Maine Department of Environmental Protection (PETE/MDEP). 2005. Urban Streams Nonpoint Source Assessments in Maine, Final Report. Meidel, S., PETE, South Portland, ME; DEPLW0699.

Schueler, T. 1994. The Importance of Imperviousness. Watershed Protection Techniques 1: 100-111.

U.S. Department of Agriculture (US DA). 1986. Urban Hydrology for Small Watersheds. Natural Resources Conservation Service, TR-55, 2nd ed.; 210-VI-TR-55.

U.S. Environmental Protection Agency (US EPA). 1999. Regional Guidance on Submittal Requirements for Lake and Reservoir Nutrient TMDLs. US-EPA Office of Ecosystem Protection, New England Region, Boston, MA.

2000. Stressor Identification Guidance Document. Cormier, S., S. Norton, and G. Suter. Office of Water, and Office of Research and Development, Washington, D.C.; EPA/822/B-00/025.

WEB-BASED RESOURCES FOR INFORMATION ON STORMWATER ISSUES AND BEST MANAGEMENT PRACTICES

Note that this list is only a starting point and does not attempt to be comprehensive.

Center for Watershed Protection. Publications and Stormwater Management.
http://www.cwp.org/pubs_download.htm
http://www.cwp.org/stormwater_mgt.htm

City of Nashua, New Hampshire. 2003. Alternative Stormwater Management Methods. Part 2 – Designs and Specifications. City of Nashua, New Hampshire
http://ceiengineers.com/publications/nashuamanualpart2.pdf

Connecticut NEMO (Non-point Education for Municipal Officials). Reducing Runoff.
http://nemo.uconn.edu/reducing_runoff/index.htm

Connecticut River Joint Commissions (CRJC). 2000. Introduction to Riparian Buffers for the Connecticut River Watershed. CRJC, Charlestown, NH. 4 pp.
www.crjc.org/buffers/Introduction.pdf

Cumberland County Soil and Water Conservation District. Technical Assistance.
http://www.cumberlandswcd.org/Technical%20Assistance.htm

Environmental Protection Agency (EPA). Stormwater Program, Low Impact Development (LID) page, and Encouraging Smart Growth.
http://cfpub.epa.gov/npdes/home.cfm?program_id=6
http://www.epa.gov/owow/nps/lid/
http://www.epa.gov/smartgrowth/

Maine Department of Environmental Protection (MDEP). Stormwater Program, “think blue”, and Nonpoint Source Pollution education.
http://www.maine.gov/dep/blwq/docstand/stormwater/
http://www.thinkbluemaine.org/
http://www.maine.gov/dep/blwq/doceducation/nps/background.htm

2003a. Maine Erosion and Sediment Control BMPs. Maine Department of Environmental Protection, BLWQ, Augusta, ME; DEPLW 0588.
http://www.maine.gov/dep/blwq/docstand/escbmps/

Maine NEMO (Non-point Education for Municipal Officials). Fact sheets.
http://www.mainenemo.org/publication.htm

Maine State Planning Office (MSOP). Sprawl & Smart Growth Resources.
http://www.state.me.us/spo/landuse/resources/sprawl.php

The Stormwater Manager’s Resource Center
http://www.stormwatercenter.net/